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*PROCESS FOR RECORDING A SCRAMBLED MPEG STREAM

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JC867 U.S. PTO

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. PF990077
First Inventor or Application Identifier P. Leyendecker
Title See *Above
Express Mail Label No. EL533621862US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 16]
(preferred arrangement set forth below)
 - Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 2]
4. Oath or Declaration [Total Pages 1]
 - a. ☒ Newly executed (original or copy)
 - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
 - a. ☐ Computer Readable Copy
 - b. ☐ Paper Copy (identical to computer copy)
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ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney
(when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☒ Information Disclosure Statement (IDS)/PTO-1449 ☒ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☐ * Small Entity Statement(s) filed in prior application, Status still proper and desired
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Signature	<i>[Signature]</i>	Date	20 Nov 2000

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TOTAL AMOUNT OF PAYMENT (\$)
1230.00**Complete if Known**

Application Number	
Filing Date	Herewith
First Named Inventor	Philippe Leyendecker
Examiner Name	
Group / Art Unit	
Attorney Docket No	PF990077

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Large Entity		Small Entity		Fee Description	Fee Paid
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101	690	201	345	Utility filing fee	710
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) (\$)
710.00**2. EXTRA CLAIM FEES**

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	9 - 20** = 6	80	480.00
Multiple Dependent			

**or number previously paid, if greater; For Reissues, see below

Large Entity Small Entity

Large Entity		Small Entity		Fee Description
Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$)
480.00**FEE CALCULATION** (continued)**3. ADDITIONAL FEES**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	Fee Code (\$)		
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	380	216	190	Extension for reply within second month	
117	870	217	435	Extension for reply within third month	
118	1,380	218	680	Extension for reply within fourth month	
128	1,850	228	925	Extension for reply within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40.00
148	690	248	345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	690	249	345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

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40.00**SUBMITTED BY**

Name (Print/Type)	Harvey D. Fried	Registration No. (Attorney/Agent)	28,298	Telephone	609/734-9839
Signature		Date	20 Nov 2000		

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Process for recording a scrambled MPEG stream

Field of the invention

5 The invention relates to a process for recording on a recording medium, for example a hard disk, a scrambled audio video digital data stream, for example an MPEG type stream.

Background of the invention

10 The storage of data in scrambled form is currently developing rapidly. For example, the audio video digital data transmitted in compressed and scrambled form are generally recorded in this form so as to control access to these data. They are therefore
15 descrambled only when the corresponding images are viewed. Another example relates to the 1394 digital bus, solutions envisaged within the framework of the exploitation of this digital bus being the transmission of digital data in scrambled form and hence their
20 storage in this form.

A problem connected with this recording of digital video data streams in scrambled form relates to the exploitation of particular modes of reading or special modes referred to hereinafter as the "trick
25 mode", using the terminology of the MPEG standard, this term encompassing among other things the following functions: fast forward, fast rewind, slow motion, accelerated motion, freeze frame. These functions actually require access and fast decoding of these
30 recorded data, conditions which are difficult to make compatible with recording in scrambled mode.

Summary of the invention

35 The aim of the invention is to alleviate the aforesaid drawbacks.

Its subject is a process for recording, on a recording medium, a scrambled MPEG stream, characterized in that the scrambled data of the stream are, in parallel with their recording, descrambled so

as to extract therefrom additional data corresponding to information required by at least one function of the special mode or "trick mode" (fast forward, fast rewind, accelerated motion, slow motion, etc.) and in
5 that these additional data are also recorded on the recording medium.

The additional data are for example the pointers and the size of images.

The subject of the invention is also a
10 recording medium, characterized in that it contains the data of a scrambled MPEG stream as well as additional data relating to the video data of the stream for the operation of the special mode or "trick mode".

15 The subject of the invention is also an MPEG audio video digital data stream, characterized in that the video data packets are scrambled with the exception of the packets containing a start of image.

20 The subject of the invention is also an MPEG audio video digital data stream, characterized in that it includes additional data allowing the extraction of the information required by at least one function of the "trick mode" and in that the said additional data
25 are transported in the adaptation field (to use the MPEG terminology) of the stream.

The subject of the invention is also a process for coding a video data stream, characterized in that
30 it comprises:

- coding of the data according to the MPEG standard so as to deliver a transport stream in the form of data packets,
- scrambling of the data packets which do not
35 include a start of image, the other packets not being scrambled.

The subject of the invention is also a process for recording on a recording medium, a scrambled MPEG

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stream, characterized in that the additional data relating to the enciphering keys are, in parallel with the recording of the stream, extracted from the stream so as also to be recorded on the recording medium.

5

According to one variant, the process is characterized in that the additional data relating to the keys are the pointers of the packets in which the keys are to be found and pointers of packets to which these keys are applied.

10

According to another variant, the process is characterized in that the additional data relating to the keys are also the deciphered keys.

15

The subject of the invention is also a recording medium, characterized in that it contains the data of a scrambled MPEG stream as well as additional data relating to the enciphering keys.

20

By virtue of the invention, the information required by the special modes are directly exploitable without it being necessary to descramble the recorded data in order to retrieve or calculate this information, thus allowing a fast response to the commands of the operator.

25

The main advantage of the invention is that it allows the use of the trick mode when reading audio video data recorded in scrambled form.

30

Brief description of the drawings

Other characteristics and advantages of the invention will become apparent on reading the following description, given by way of example and with reference to the figures which represent:

35

- figure 1, a flowchart defining the steps of the process for recording additional data,

- figure 2, a flowchart defining the steps of the process for recording data relating to the enciphering keys.

5 Detailed description of the preferred embodiments

10 The scrambled audio video data stream is for example the transport stream (TS) as defined in the MPEG standard. The scrambling of the stream or of a packet relates to the useful data (or "payload") and not to the packet headers. This stream is therefore received by the recording device in scrambled form.

 The process implemented by this device is shown schematically by the flowchart of Figure 1.

15 A first step 1 consists in filtering the stream received on the basis of the programme choice made, in the case where one wishes to record a single programme. This filtering is performed on the PID (Packet header Identification).

20 The partial stream obtained, corresponding to the selected programme, is processed in parallel in step 2, step 3 and step 6.

 It is thus transmitted directly to a storage unit or recording medium for recording, step 6.

25 It is also transmitted to a keys extraction circuit for extracting the data (sections) allowing the descrambling of the packets, step 2. This step 2 carries out the extraction, from the scrambled stream, of the keys, possibly encrypted, together in this case with their decryption.

30 Step 3 extracts, from the partial stream, the packets containing the video information for descrambling by a descrambling circuit. The keys required for this descrambling originate from step 2.

35 This descrambling obviously requires that the conditional access control system should temporarily allow, during this data recording phase, which must be distinguished from the phase of viewing these video data, descrambling of the stream received, that is to say should require the conditional access information

5 From these descrambled video data are
extracted, during the next step 4, the information,
referred to as ancillary data or additional data,
required for the operation of the "trick mode". This
information may, among other things, be the size of the
10 images, the pointers defining the image starts, the
image types, etc.

During this step 6, the scrambled data corresponding to the partial stream originating from step 1 are also recorded.

There should be a time correspondence between the ancillary or additional data of the recorded files and the recorded scrambled data. The recorded
30 additional data are for example indexed to the corresponding data of the audio video file.

It is of course also conceivable, without departing from the field of the invention, to record the entire MPEG stream and not just the demultiplexed stream, that is to say the partial stream. It is also possible to choose certain programmes and to record these chosen programmes only. It may also happen that in one and the same programme there are several video streams (PIDs) corresponding for example to several

angles of view. The method is then applied, independently, to each of these video streams which are recorded. One can have an accompanying file for each video stream.

5 Preferably, the descrambling circuits are integrated into the circuits catering for the extraction of the data relating to the trick mode so as to prevent any access to the descrambled audio video stream.

10

 Variants of the invention consist in creating an MPEG stream containing the information relating to the "trick mode" or additional data in unscrambled form and the other data in scrambled form.

15

 For example, solely the packets containing the information useful for the "trick mode" are not scrambled. This information may then be recognized and extracted easily with the aid of a handler, without it being necessary to descramble the stream. This involves
20 for example packets which include an image start and provide the image type, etc. Thus, steps 2 and 3 consisting in extracting the keys and in descrambling so as to obtain the additional data are no longer required, these additional data, such as image start,
25 image type, etc., being obtained from the unscrambled packets of the data stream.

 In another example, one or more fields belonging for example to the "Adaptation Field" of a video packet, in the transport stream, and grouping
30 together private data are what are exploited to transport the data useful to the trick mode. Step 4 extracts the "trick mode" information directly from the "Adaptation Field".

 Steps 2 and 3 corresponding to the extraction
35 of the keys and to the descrambling of the video data are, here again, no longer useful. It is in fact no longer necessary to descramble the data stream in order to extract the information useful to the trick mode and

hence to get access privileges for descrambling, when storing the data on the recording medium.

However, these variants necessitate intervention at the level of the data stream coding chain and hence generate a constraint at the level of the broadcaster, but make it possible to circumvent the access control and security problems related to temporary descrambling.

10

The use of the "trick mode" requires, in addition to the useful information stored in the accompanying file, information on the keys to be used for each packet in order to be able to carry out the descrambling.

15

This is because, when accessing any point of an image sequence, the descrambling of the images to be viewed during the trick mode requires the reading, and possibly the deciphering, of the corresponding enciphering key. The keys are available, in the stream, roughly every 100 ms, in a manner which is desynchronized with respect to the images and sufficiently in advance as to be able to perform the descrambling in real time. The deciphered keys must in fact be available when the corresponding scrambled data are read.

20

25

Whereas this availability poses no problem in conventional read mode, matters are otherwise when exploiting the "trick mode". This is because, in this case, the data relating to the keys and provided in advance in the stream are not read on account of the ad hoc access to the images useful to the trick mode and are therefore not available in advance.

30

One solution consists in "putting back" the data stream sufficiently, with respect to the point of access, for example by half a second, as to be able to extract and decode the enciphering keys before reading the data to be deciphered. The read pointer or read head of the storage medium is positioned a few hundred

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milliseconds before the point of access to the image which one wishes to decode and whose position one knows by virtue of the pointer extracted from the accompanying file. This solution entails a lag in
5 response and requires that non-useful data be read, possibly giving rise to errors.

The process which is proposed here and which can be exploited independently or in combination with the process described earlier, consists in performing
10 specific operations on the keys so as to ease the descrambling of the data during the "trick mode".

Figure 2 represents the various steps of the process implemented. Steps 1, 3, 4 and 5 are similar to those described earlier and the same numbering is
15 employed. A new step 7 replaces step 2, performing operations complementary to those of step 2 dependent on the solution adopted, as indicated hereinbelow. This step 7 is followed by a new step 8 which creates one or more files in which the information originating from
20 step 7 is stored. Finally, the data from these files are transmitted to the recording medium so as to be stored there during step 6.

A first solution consists in tagging the position of the packets in the stream containing the
25 encrypted keys, in storing the pointers corresponding to these packets as well as the pointers indicating the portion of the stream to which these keys are applied. Step 7 as a supplement therefore to the extracting of the keys transmitted in step 3 for the descrambling of
30 the video data, extracts the pointers or indices so as to transmit them in step 8 in order to be stored in an accompanying file, the file then being recorded on the recording medium in step 6.

Thus, during the operation of a special mode,
35 the accompanying file provides the position of the packets containing the keys applied to the portion of stream to be read. These packets are read and the keys extracted for the deciphering of the portion of stream to be read.

5 A second solution consists in transmitting the
encrypted keys extracted during step 7, not only in
step 3 for the descrambling of the video data but also
in step 8 for their storage in an accompanying file. As
before, the process also consists, during step 7, in
tagging the position of the packets in the stream
containing the encrypted keys, in storing the pointers
corresponding to these packets as well as the pointers
indicating that portion of the stream to which these
10 keys are applied. These pointers or indices are then
extracted so as to be transmitted in step 8. This step
stores the keys as well as the pointers or indices. The
accompanying file comprises, in this case, the
enciphering keys and it is then not necessary to fetch
15 them from the recorded stream.

20 A third solution consists, during this step 7,
in addition to the previous operations, in decrypting
the keys. These keys are transmitted to the access
control device which decrypts them. The decrypted keys
as well as the pointers or indices are stored in a
file, this file is recorded on the recording medium
during step 6, in the form of an accompanying file with
a view to the use of its content to descramble the
audio and/or video data relating to these keys.

25 Of course, all these data may be recorded in
separate accompanying files.

30 There should always be a time correspondence
between the data of this (these) recorded file(s) and
the recorded scrambled data. The recorded data are for
example indexed to the corresponding data of the audio
video file.

35 The invention applies to any type of recording
medium, for example a hard disk or a DVD (the acronym
standing for Digital Versatile Disk).

Variant embodiments are proposed hereinbelow.

Regarding the extracting of the keys which is performed in step 7, a fourth solution consists, during this step 7, in addition to the previous operations, in decrypting the keys and in then re-encrypting them according to another algorithm. These keys are transmitted to the access control device which decrypts them. The decrypted keys are then transmitted to another enciphering device. The re-encrypted keys as well as the pointers or indices are stored in a file, this file is recorded on the recording medium during step 6, in the form of an accompanying file with a view to the use of its content to descramble the audio and/or video data relating to these keys.

Regarding the pointers recorded in step 8, indicating that portion of the stream to which the keys are applied, a precise value of these pointers, that is to say which corresponds to the stream portion relevant to the key, is not necessary.

In general the encrypted keys are sent in pairs, applying to two contiguous portions of stream; moreover, the two decrypted keys are available to the demultiplexer at any time, so as to ensure correct transition between the two portions of stream. One way of indexing the stream is therefore to store the keys in pairs and to associate therewith a pair of pointers corresponding to the start and to the end of a stream segment to which each of the two keys is applied in succession. These pointers may for example be generated when the pairs of decrypted keys are received from the access control system (the "smart card" or chip card).

It may in fact be noted that the start of a stream portion to which a key is applied is characterized, in an MPEG stream, by a change of value of the "transport_scrambling_control" field in the header of a packet. It is the detecting of this change which will decide on the application of the new key from the pair of keys. It is therefore sufficient to link a pair of keys to a pointer designating a packet

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What is claimed is

1. A process for recording, on a recording medium, a scrambled digital video stream, wherein the
5 scrambled data of said stream are, in parallel with their recording, descrambled so as to extract therefrom additional data corresponding to information required by at least one function of the special mode or "trick mode" (fast forward, fast rewind, accelerated motion,
10 slow motion, etc.) and wherein these additional data are also recorded on the recording medium.

2. A process according to claim 1, wherein said additional data are the pointers and the size of images.

15 3. A process according to claim 1, wherein said digital video stream is an MPEG stream obtained by filtering the TS (Transport Stream) headers of a multiprogramme MPEG stream, as a function of the selected programme or programmes to be recorded.

20 4. A process according to claim 1, wherein said recording medium is a hard disk or a recordable DVD.

5. A recording medium containing the data of a scrambled digital video stream as well as additional
25 data relating to the video data of the stream for the operation of the special mode or "trick mode".

6. An MPEG audio video digital data stream, wherein the video data packets are scrambled with the exception of the packets containing a start of image.

30 7. An MPEG audio video digital data stream, comprising additional data allowing the extraction of the information required by at least one function of the "trick mode", said additional data being transported in the "adaptation field" of the stream.

35 8. A process for coding a digital video data stream, comprising the following steps:

- coding of the data according to the MPEG standard so as to deliver a transport stream in the form of data packets,

- scrambling of the data packets which do not include a start of image, the other packets not being scrambled.

5 9. A process for recording on a recording medium, a scrambled digital video stream, wherein the stream is descrambled in such a way as to extract additional data relating to the keys for enciphering this scrambled stream and in that these data are also recorded on the recording medium.

10 10. A process according to claim 9, wherein the additional data relating to the keys are the pointers of the packets in which the keys are to be found and pointers of packets to which these keys are applied.

15 11. A process according to claim 10, wherein the pointers of packets to which these keys are applied are the pointers defining the stream portions to which the keys are applied.

20 12. A process according to claim 11, wherein the pointers to the stream portions to which the keys are applied are obtained from the information concerning a change of value of the "transport_scrambling_control" field of the scrambled MPEG stream.

25 13. A process according to claim 10, wherein the pointers of packets to which these keys are applied are pointers defining a stream segment to which each of the two keys of a pair of keys is applied in succession.

30 14. A process according to claim 10, wherein the enciphered keys are extracted from the stream so as to be recorded with the additional data relating to the keys.

35 15. A process according to claim 10, wherein the additional data relating to the keys are the deciphered keys.

16. A process according to claim 10, wherein the additional data relating to the keys are also the

deciphered keys then deciphered with another enciphering device.

17. A process according to claim 9, wherein the recording medium is a hard disk or a recordable
5 DVD.

18. A recording medium containing the data of a scrambled digital video stream as well as additional data relating to the enciphering keys.

19. A process for decoding a scrambled MPEG
10 stream recorded on a recording medium, for implementing a special mode ("trick mode"), comprising the following steps:

the reading, from the recording medium, of scrambled data of the MPEG stream,

15 the reading, from the recording medium, of additional data other than the scrambled data of the MPEG stream, corresponding to information relating to the enciphering keys used for the scrambling,

descrambling of the MPEG stream data read as a
20 function of the additional data read.

20. A process for decoding a scrambled MPEG stream recorded on a recording medium, for implementing a special mode ("trick mode"), comprising the following steps:

25 reading, from the recording medium, of additional data, other than the scrambled data of the MPEG stream, corresponding to information required by at least one function of the special mode or "trick mode" (fast forward, fast rewind, accelerated motion,
30 slow motion, etc.),

reading, from the recording medium, of scrambled data of the MPEG stream as a function of the said additional data.

ABSTRACT

The process is characterized in that the
scrambled data of the stream are, in parallel with
5 their recording (6), descrambled (2, 3) so as to
extract (4) therefrom additional data corresponding to
information required by at least one function of the
special mode or "trick mode" (fast forward, fast
rewind, accelerated motion, slow motion, etc.) and in
10 that these additional data are also recorded (6) on the
recording medium.

Applications relate most particularly to
recordings on hard disk or DVD.

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Fig.1.

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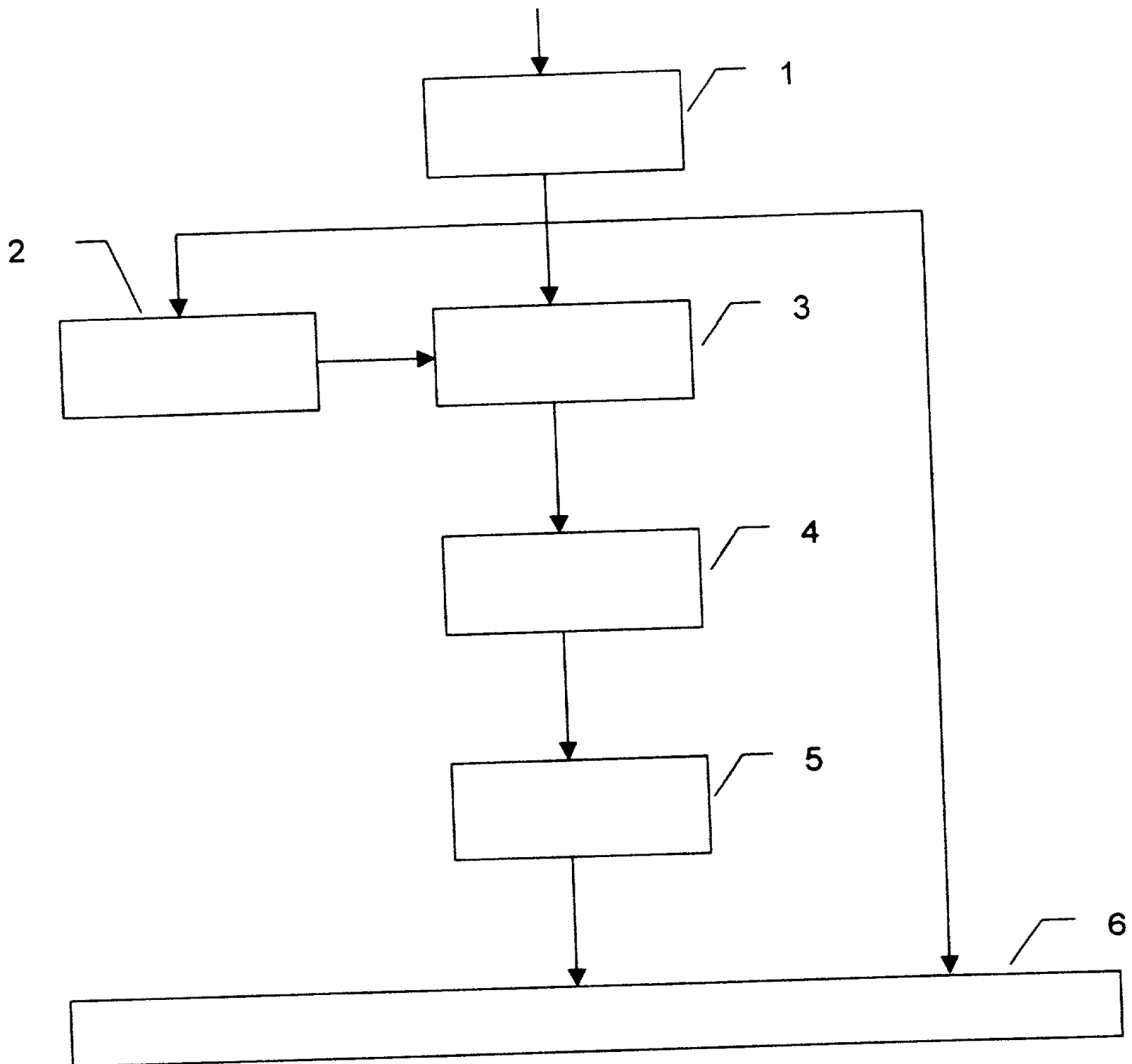


FIG. 1

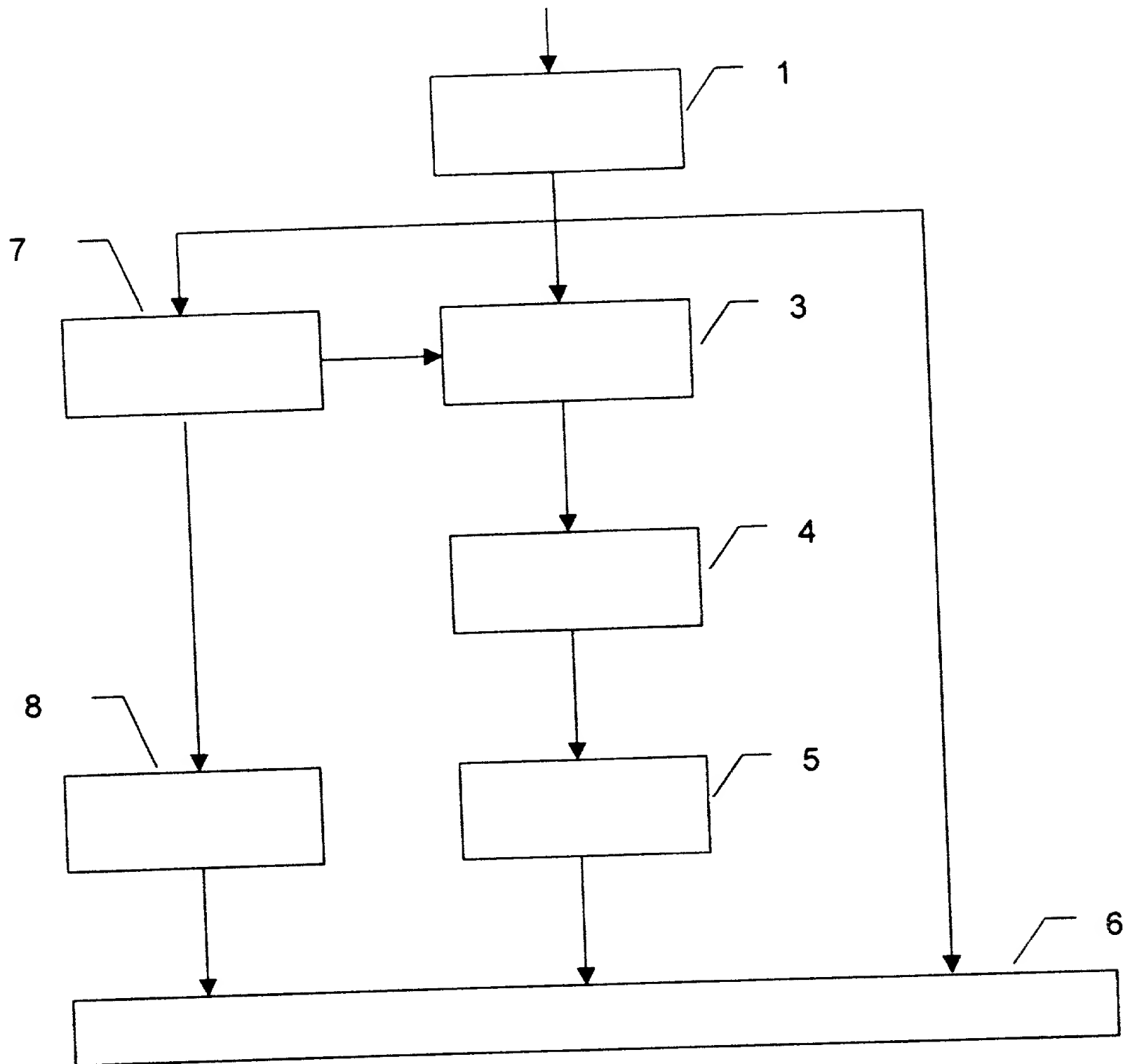


FIG. 2

DECLARATION FOR UNITED STATES PATENT APPLICATION,
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As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

PROCESS FOR RECORDING A SCRAMBLED MPEG STREAM

the specification of which

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I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent, utility model, design or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
Number	Country	Date Filed	Yes	No
9914647	FR	November 22, 1999	xx	

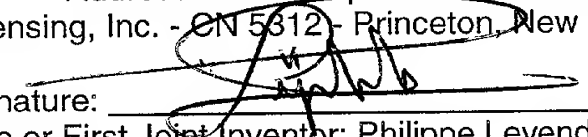
I hereby claim the benefit under 35 USC 120 of any US Application(s) listed below, and, insofar as the subject matter of each of the claims of this Application is not disclosed in the prior US application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

Serial No.: _____ Filed: _____

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under of 18 USC 1001 and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Joseph S. Tripoli (Reg. No. 26,040), Dennis H. Irlbeck (Reg. No. 26,372), Eric Herrmann (Reg. No. 29,169) and Joseph J. Laks (Reg. No. 27,914) Telephone: (609) 734-9813.

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Signature:  Date: 8th day of November, 2000.

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